

Riding the wave of the Future

Robo-Boat

Monitoring South Florida's Water in the 21st Century



ROBO BOAT
patent applied for

STREAMGAUGING

STREAM • GAUG • ING (strēm' gāj - ing) v. [also dis•charge mea•sure•ment] the act of measuring the rate of flow of water in a canal, river, or stream.

The data collected is used to verify equations that compute the volume of water discharged through South Florida Water Management District structures. In turn, this information is used in all of the District's key operations, including water supply, flood control, water quality, and the restoration of natural systems.

The challenge has been to provide quality streamflow data on a timely basis, using existing staff.

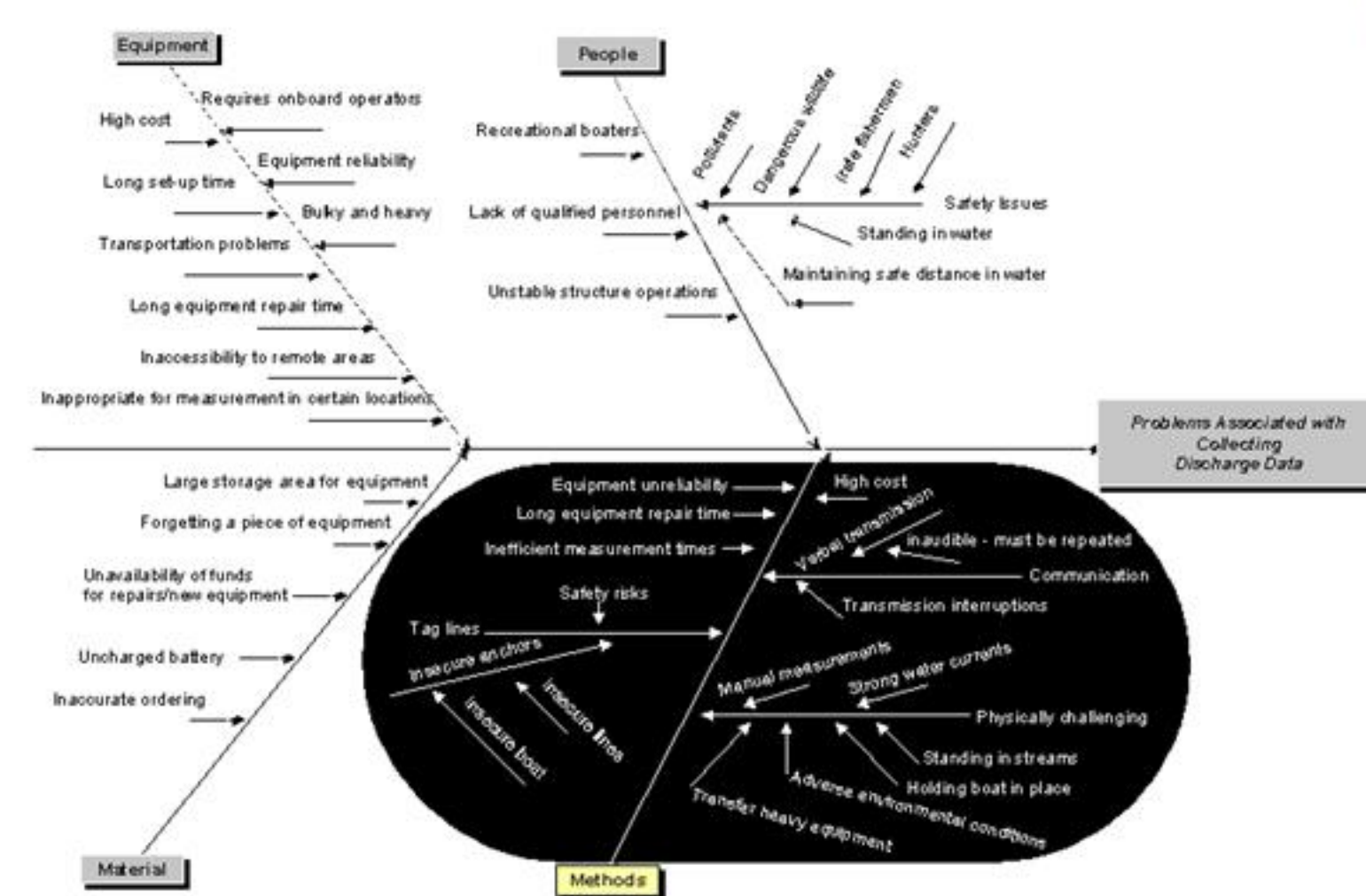
* To do more with less while maintaining accuracy without incurring additional costs

Comparing Our Streamgauging Methods & Costs

<p>1. Method: Price AA Current Meter "Wading"</p> <p>Safety Issues: Drowning, Environmental Hazards, Boat / Trailer Accidents</p> <p>Costs Per Measurement</p> <p>L = 702.79 E = 563.95 T = 91.92 TC = \$1,358.66</p>	<p>4. Method: Acoustic Current Meter (ACM)</p> <p>Safety Issues: Drowning, Environmental Hazards, Boat / Trailer Accidents</p> <p>Costs Per Measurement</p> <p>L = 616.34 E = 1,876.45 T = 91.92 TC = \$2,584.71</p>
<p>2. Method: Price AA Current Meter "Bridge/Bank"</p> <p>Safety Issues: Street Traffic, Urban & Environmental Hazards</p> <p>Costs Per Measurement</p> <p>L = 702.79 E = 460.97 T = 91.92 TC = \$1,255.68</p>	<p>5. Method: Acoustic Doppler Current Profiler (ADCP)</p> <p>Safety Issues: Drowning, Environmental Hazards, Boat / Trailer Accidents</p> <p>Costs Per Measurement</p> <p>L = 265.79 E = 63.50 T = 91.92 TC = \$421.21</p>
<p>3. Method: Price AA Current Meter "Boat"</p> <p>Safety Issues: Drowning, Environmental Hazards, Boat / Trailer Accidents</p> <p>Costs Per Measurement</p> <p>L = 702.79 E = 330.58 T = 91.92 TC = \$1,125.29</p>	<p>6. Method: Ultrasonic Velocity Meter (UVM)</p> <p>Safety Issues: Drowning, Environmental Hazards, Boat / Trailer Accidents</p> <p>Costs Per Measurement</p> <p>L = 267.31 E = 279.78 T = 91.92 TC = \$639.01</p>
<p>7. Method: Dye Dilution</p> <p>Safety Issues: Drowning, Environmental Hazards, Boat / Trailer Accidents</p> <p>Costs Per Measurement</p> <p>L = 1,011.72 E = 2,070.20 T = 91.92 TC = \$3,173.84</p>	

Legend
L = Labor Costs
E = Equipment Costs
T = Transportation Costs
TC = Total Costs

Analyzing Problems & Confirming Causes



After reviewing the factors that cause problems associated with collecting discharge data, we focused on methods, high cost and safety. Our power to make immediate changes in the areas of Equipment, People, and Material was limited due to a lack of resources.

Reviewing Available Options / Solutions

As a result of participating in a Hydro-Acoustic workshop focusing on current methods of streamgauging, Anier Sosa conceptualized ROBO-BOT in 1999.

Why re-invent the wheel?

Tethered boats do not work well in our canal system because our canal system does not always have a bridge or open access to areas needing measurement. We decided to improve on this technology since the commercially available alternatives did not fit the District's needs.

The Robo-Boat was the safest and most cost-effective improvement alternative, with no losses in quality.

ALTERNATIVES CONSIDERED

Tethered Boats (shown at right):
Requires a bridge to tow boat across the canal.
Requires open access to both sides of a canal. Must use a tag line across the canal to the guide boat. Will not operate in hazardous or confined areas.

Full-size unmanned boat (not shown): Difficult to launch from canal banks due to size. Can not restart in canal if gasoline motor stalls. Dangerous if radio control signal is lost. More expensive than manned vessel. High maintenance costs.

Authorized to Proceed



Inventor, Anier Sosa, Sr. is a Sr. Supervising Engineering Associate in the Hydrology & Hydraulics Division. Anier has an A.S. degree in Electrical Engineering. *Design, Analysis, and Construction phases.



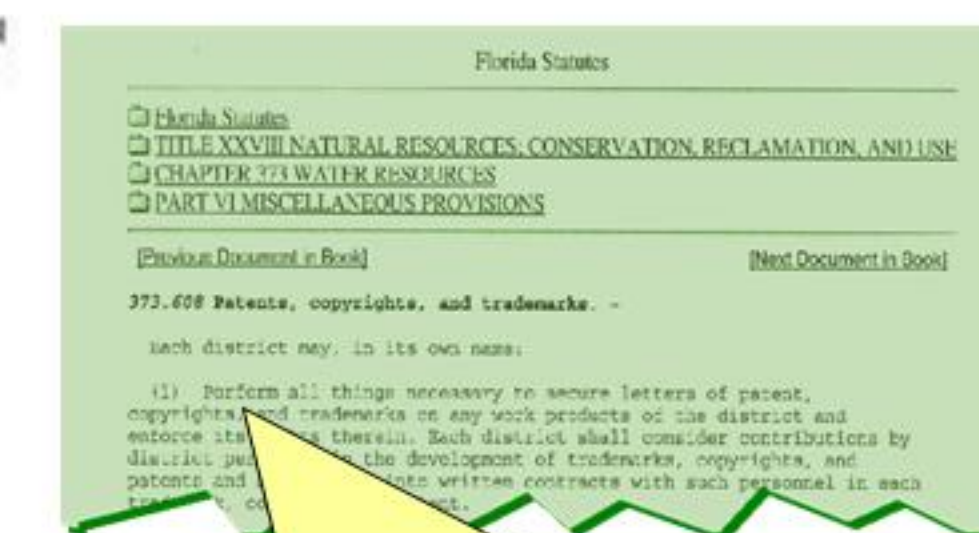
Partner, Thomas Brown, is a Specialist Engineering Associate in the Hydrology & Hydraulics Division. Tom has an A.S. degree in Mechanical Engineering. *Construction phase.



Robo-Boat FEATURES

- Reduces deployment setup time.
- Requires no ramps.
- Loads onto the bed of a standard pickup truck.
- Reduces training time.
- Affords real time data collection.
- Offers a high level of safety in storm conditions.
- Modifies and expands to meet future needs.
- Eliminates the need and cost for full sized boat and trailer.
- Operates in remote and areas inaccessible for full size boats.
- Performs measurements at virtually all District structures.

Full Speed Ahead SFWMD Applies for Robo-Boat Patent



Robo-Boat Effects Change in Legislation!

Water management districts did not have legal authority to secure patents, copyrights or trademarks prior to June 2001.

The Legislature passed Section 373.608 Florida Statutes which now allows the water management districts to obtain patents, copyrights or trademarks for intellectual property.



The SFWMD Excellence Award was presented to Anier Sosa and Tom Brown. To our knowledge, no other agency in the U.S. that is involved in streamgauging activities has developed such use of this technology.

Ancillary Benefits

- Saving dollars & doing more with taxpayer's money.**
- Water Quality Sampling and Monitoring:** Minimal disturbance to the water column. Eliminate the need for Air Boats. No contamination from fuels and oils.
- Structure Maintenance:** Investigate damages, including leaks to culverts. Reduce the need for and safety risks to divers.
- GIS and Survey:** Provide specific coordinates for flow measurement, using a GPS and ArcInfo.
- Emergency Recovery:** Robo-Boat has proven capabilities in towing a full-size equipped boat and crew as well as other emergency responses.

